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**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

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In the Matter of)
)
Advanced Television Systems)
and Their Impact Upon the)
Existing Television Broadcast)
Service)

MM Docket No. 87-268

Fifth Further Notice of)
Proposed Rule Making)

COMMENTS OF THE DIGITAL HDTV GRAND ALLIANCE

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July 11, 1996

SUMMARY

The Grand Alliance applauds and enthusiastically endorses the Commission's tentative decision to adopt the ATSC DTV Standard and to require digital broadcast licensees to implement the standard in its entirety. Over the past nine years, reliance on the Commission's oft-repeated commitment to adopt a single DTV standard based on the recommendation of its Advisory Committee has guided the industry and motivated the considerable investments of financial and human resources by the Grand Alliance members and dozens of other firms in the affected industries. We believe that it is imperative for the Commission to adopt a single DTV standard in order to provide clear and certain ground rules for broadcasters, manufacturers and consumers, and that the ATSC DTV Standard based on the Grand Alliance system is the best possible standard to adopt and is more than fully adequate. After nearly a decade developing world-leading digital television technology, all that remains is for the Commission to approve the recommended standard in order to trigger a flood of investment that will bring the benefits of this bountiful new technology to the American people.

The ATSC DTV Standard based on the Grand Alliance system represents by far the world's best digital broadcast television system, with unmatched flexibility and unprecedented ability to incorporate future improvements. Implementing this technology will dramatically increase the technical quality of broadcast television, helping to preserve for consumers and for our democratic society the benefits of a vibrant and healthy free over-the-air television service in the future. In addition, deploying this technology will give consumers access to a host of potential information services that can help meet pressing needs in health care, education and other areas, and will create and preserve tens of thousands of high-skill, high-wage jobs and engender substantial economic growth.

The Grand Alliance members strongly believe that *mandating* the use of the *complete* DTV standard by digital broadcast licensees is necessary in order to provide the clarity, certainty and stability necessary for broadcasters, manufacturers and consumers to invest in digital television. By reconfirming its 1990 decision and its tentative decision in this NPRM to

require the use of a single, complete broadcast standard, the Commission can promote a swift transition to digital broadcast television, drive broadcaster and consumer costs down rapidly, and recover extremely valuable television spectrum as soon as possible.

Two alternative approaches -- authorizing the use of the standard and prohibiting interference to it, but not requiring the use of it; and adopting a standard for allocation and assignment purposes only -- are wholly inadequate, and simply would not provide the certainty and clear direction required to get mutually dependent broadcasters, manufacturers and consumers to make consistent and mutually reinforcing investment decisions. The Commission's unfortunate experience with AM stereo radio service illustrates the folly of failing to establish a single clear standard.

Similarly, all layers of the ATSC DTV Standard should be adopted. The proposed standard represents the minimum essential requirements to provide broadcasters and equipment manufacturers the information and assurances they need, yet allows tremendous room for flexible use, and product and service differentiation and enhancements.

We strongly believe that concerns noted in the NPRM regarding the potential obsolescence of the standard are greatly exaggerated, and that a sunset provision on the mandatory use of the ATSC DTV Standard is unnecessary and would undermine the Commission's goal to promote a smooth and swift transition. For proposals to modify, to make nonmandatory, or eventually even to replace the ATSC DTV Standard, we believe the Commission should rely on its existing processes and on proposals raised initially through an organization such as the ATSC, where membership is open to all interested parties, and where a cross-industry consensus can be developed.

Over the past decade, and especially during the last five years, the Advisory Committee has worked extensively to ensure that its recommended standard maximized interoperability with alternative media, including computers and telecommunications. As a result, the ATSC DTV Standard is more easily interoperable, by far, with computers and telecommunications than any other digital television service on the planet. We are convinced

that it provides *more than adequate* interoperability with alternative media, that no critical interoperability problems remain, and that no further actions by the Commission are required to facilitate interoperability. None of the objections raised by some members of the computer and motion picture industries are new issues. They have been raised and debated thoroughly and repeatedly, and addressed fully in the Advisory Committee recommendation which was adopted without objection by the Advisory Committee members, including members of these industries.

Although the Advisory Committee's charter was to recommend a *terrestrial broadcast* ATV transmission standard, from the beginning the easy interoperability of the standard with cable TV systems was a key objective in the development of the Grand Alliance system and the ATSC DTV Standard. As a result, the Grand Alliance members believe that as voluntary standards activities continue in the cable industry, as well as for other video delivery media, many elements of the terrestrial ATV standard are likely to be incorporated in emerging standards in these industries. We believe that such voluntary standards will promote the early availability of digital television, including HDTV, over all of these other media as well as terrestrial broadcasts, without causing undue burdens on cable operators or other providers.

Regarding the potential need for the Commission to impose requirements on receiver manufacturers, the statements of manufacturers and broadcasters alike make clear that digital receivers will have all-format reception capability without any government mandate to do so. With respect to other aspects of the reception performance of receivers, we believe that the same marketplace forces that operate today to ensure that television manufacturers provide adequate reception performance will continue to motivate manufacturers to compete to provide high-quality receivers. If it is determined that any minimum performance levels need to be established for DTV receivers, they should be the subject of voluntary industry standards, just as they have been with the current analog system for many years.

Throughout this process, the Advisory Committee, the Grand Alliance and the ATSC have taken great pains to assure that the recommended standard provides maximum

compatibility with international standards. We believe the ATSC DTV Standard represents by far the world's best digital television technology, yet while this superior system awaits final Commission approval, far less capable, less computer-friendly systems are being adopted around the world, even for some digital television services in the United States. At this point in time, the most important thing the Commission can do to facilitate international compatibility and to promote export opportunities is to adopt the ATSC DTV Standard as rapidly as possible. Notwithstanding the broad industry consensus supporting the ATSC DTV Standard, any further delays in adopting the standard would squander the U.S. technological lead and risk seeing the U.S. "re-leap-frogged" in exploiting this innovative American-born technology.

Over the past decade, the Commission has championed a unique process, providing leadership, policy direction and support, while relying on private investment, competition and a volunteer army of experts and leaders from the affected industries to develop a stunning technological achievement. Through this open, thorough process, an extremely broad consensus has been achieved, delicately balancing the needs of consumers and the various industries involved. In sharp contrast, there is no consensus at all supporting the changes proposed by the few detractors of the proposed standard.

Now it is time for the Commission to act decisively, to follow through on its repeated commitments to industry over the past decade to set a new broadcast television standard. The Grand Alliance members implore the Commission to adopt the full ATSC DTV Standard as swiftly as possible and mandate its use by digital broadcast licensees. In so doing, the Commission will provide the certainty and reliability required by financiers, broadcasters, manufacturers and consumers to unleash the further substantial investments necessary to bring the benefits of this fertile technology to the American public and to spread those benefits throughout the world.

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COMMENTS OF THE DIGITAL HDTV GRAND ALLIANCE

I. Introduction

The *digital* HDTV Grand Alliance ("Grand Alliance") respectfully submits these comments on the Commission's Fifth Further Notice of Proposed Rule Making ("NPRM") in its Advanced Television ("ATV") proceeding.¹ The NPRM continues the Commission's efforts to usher in the next era of broadcast television -- *digital television* -- and seeks comment on the Commission's proposal to require digital television licensees to use the digital television ("DTV") standard recommended to the Commission by its Advisory Committee on Advanced Television Service ("Advisory Committee"). This recommended standard has also

¹The *digital* HDTV Grand Alliance was formed in 1993 to combine the best elements of four previously competing all-digital high-definition television ("HDTV") systems, and consists of Lucent Technologies, Inc. (formerly AT&T), General Instrument Corporation, the Massachusetts Institute of Technology, Philips Electronics North America Corporation, Thomson Consumer Electronics, the David Sarnoff Research Center, and Zenith Electronics Corporation. Under the direction of the Commission's Advisory Committee on Advanced Television Service ("Advisory Committee"), the Grand Alliance designed and constructed a prototype best-of-the-best HDTV system which was tested extensively by the Advisory Committee and found to exceed performance requirements and expectations. On November 28, 1995, the Advisory Committee voted without objection to recommend to the Commission a digital television transmission standard based on the *digital* Grand Alliance HDTV system.

been documented and endorsed by the Advanced Television Systems Committee ("ATSC") and published as the ATSC Digital Television Standard.²

The Grand Alliance enthusiastically endorses the Commission's intention to adopt the ATSC DTV Standard and to require digital broadcast licensees to use the full standard. Over the past nine years, the expectation that the Commission would adopt a single DTV standard based on the recommendation of its Advisory Committee has guided the various involved industries and motivated their considerable investments of financial and human resources. The Grand Alliance believes that it is imperative for the Commission to adopt a single DTV standard in order to provide clear and certain ground rules for broadcasters, manufacturers and consumers, and that the ATSC DTV Standard -- with its world-leading digital technology offering unprecedented flexibility and headroom for growth -- is the best possible standard to adopt, exceeding the Commission's requirements for such a system. After nearly a decade developing the world's best digital television system, all that remains is for the Commission to act promptly to approve the ATSC DTV Standard recommended by the Advisory Committee in order to unleash a flood of investment that will bring the benefits of this fertile new technology to the American people.

II. The ATSC DTV Standard

The ATSC DTV Standard based on the Grand Alliance system represents world-leading, proven technology that will deliver quantum improvements in the technical quality of broadcast television, giving broadcasters the means to compete effectively with other methods of delivering video in the decades to come, thereby helping to preserve free over-the-air broadcast television service for the benefit of the American public. And in the course of

²The ATSC is a private sector organization engaged in developing and coordinating industry standards for a wide range of emerging advanced television systems, including digital High Definition Television (HDTV) and digital Standard Definition Television (SDTV). It is composed of more than fifty corporations, industry associations, and educational institutions, including terrestrial and cable broadcasters, broadcast and consumer equipment manufacturers, and members from the motion picture, computer and telecommunications industries.

providing these improvements in entertainment, sports, education, information and news television through the introduction of HDTV and SDTV, the proposed standard establishes a generalized flexible and extensible data delivery capability as well. Thus, when consumers purchase digital HDTV receivers, they will get dazzling pictures and terrific sound, and much more -- a huge information "pipe" that can deliver more than 19 Mbps of data over each TV channel and a high-resolution display which together can support a wide variety of innovative information services. Thus, the deployment of HDTV will bring about a substantial improvement in the National Information Infrastructure ("NII"), and consumer purchases of digital receivers will help support the economical delivery of a broad range of other valuable information services. The all-digital nature of the ATSC DTV Standard and its utilization of a packetized data transport structure, together with its emphasis on progressive scan transmission formats and "square" pixels, give the system unmatched compatibility and interoperability with computer and telecommunications applications, guaranteeing its suitability for a wide range of applications that go far beyond improvements in entertainment and news television service. Indeed, as the Commission has noted, "the ATSC DTV Standard describes a remarkable system that is capable and flexible well beyond the expectations of a few short years ago. It is the product of the genius and persistence of its creators and is a tribute to their efforts." (NPRM, ¶49)

Not only is the development of the Grand Alliance HDTV system and the ATSC DTV Standard based upon it a towering technological achievement, the Commission's Advisory Committee process that produced these results represents an unsurpassed example of effective cooperation between government and industry. With strong leadership and support from the Congress and all of the FCC Commissioners, including four FCC Chairmen, the Commission has been involved in the development of this standard throughout this proceeding (NPRM ¶30), providing the key policy decisions that have guided this effort, e.g., the decisions to use 6 MHz channels, to simulcast DTV transmissions during a transition period using the taboo channels already allocated to television service, to pursue full HDTV rather than mere

enhancements of conventional television, to encourage the development of *all-digital* HDTV technology, and perhaps most important, the decision to establish the Advisory Committee under the able leadership of former FCC Chairman Richard E. Wiley to recommend an advanced television transmission standard.

With these basic guiding policies in place, the Commission then relied on private investment in an open, competitive process administered by its Advisory Committee, to evaluate 23 original proposals, to conduct comprehensive testing of six competing systems, and to oversee a final collaborative phase in which the best attributes of four "finalist" all-digital systems were combined to form the *digital* HDTV Grand Alliance system. In 1995, at the encouragement of Chairman Hundt, the ATSC and the Advisory Committee developed a strong industry consensus around a set of formats for digital *standard* definition television ("SDTV") transmission to be added to the Grand Alliance HDTV formats and incorporated into the ATSC DTV Standard, which the Advisory Committee then proposed to the Commission in its Final Report in November 1995. Throughout nearly a decade, hundreds of volunteers from dozens of firms in the television broadcasting, cable TV, broadcast equipment manufacturing, consumer electronics equipment manufacturing, motion picture, computer and telecommunications industries have participated in the Advisory Committee and ATSC processes, contributing their best efforts to specify system requirements, to develop and construct prototype hardware for the world's best advanced television system, and to verify its performance through exhaustive testing in laboratories established for this purpose as well as in subjective viewing tests and extensive field tests.³

³ Although no government funding was involved, this stunning collective achievement did not come free. These dozens of companies invested approximately \$500 million and devoted the best efforts of hundreds of their employees in the Advisory Committee process over almost a decade. The Grand Alliance members alone have invested approximately \$300 million and some of their best engineering talent -- at the expense of other opportunities -- to get to this point.

The ATSC played a key supporting role throughout the decade-long process of developing a DTV standard.⁴ The ATSC was instrumental in developing a strong industry consensus around the SDTV formats to be added to the standard based on the Grand Alliance system, and with the Commission's blessing, the ATSC undertook the task of documenting the proposed standard and making the information widely available. In early 1995, the ATSC completed its work to document a broadcast transmission system based on the Grand Alliance system, and the resulting ATSC Digital Television Standard was approved overwhelmingly by the ATSC members.

III. The Commission's Proposal to Mandate Use of All Elements of the ATSC DTV Standard Is Essential

The Grand Alliance agrees with the Commission that transmission standards, either *de facto* or *de jure*, convey many benefits (NPRM, ¶21), as do voluntary industry standards as well. A standard is required in order to provide the clarity, certainty and stability necessary for broadcasters, manufacturers and consumers to invest in digital television, and a clear, unambiguous standard is necessary to provide a reliable basis for the design of broadcast and consumer equipment. Moreover, we strongly believe that an FCC requirement *mandating* the use of the DTV standard by digital broadcast licensees is necessary to achieve these goals.

In the first place, mandating use of the DTV standard would not be a case of an arbitrary government decision attempting to impose an unproven standard upon the marketplace. The ATSC DTV Standard has been developed after a thorough, competitive process, and the proposal has won an extremely broad consensus within the affected industries. Almost without exception the participants in those industries are urging the

⁴Most of the participants in the Advisory Committee process and all of the members of the Grand Alliance are also members of the ATSC.

Commission to reinforce that consensus to allow all segments of the industry to move forward rapidly and confidently to implement the service.⁵

Moreover, as the Commission notes in the NPRM at ¶36, free over-the-air broadcast television service is entirely different from personal communications service ("PCS"), direct broadcast satellite service ("DBS"), and digital audio radio service ("DARS"). Broadcast television is an established service upon which more than 98 per cent of Americans rely, either directly or indirectly, not just for entertainment, but for news and information. As Commissioner Chong points out in her separate statement:

... free over-the-air broadcasting is fundamental to the well being of a democratic society. Without question, television is an important and even unique part of our American culture. It gives us shared national experiences, entertains us, inspires us and informs us. . . . Nearly all Americans rely on television as an important part of their daily life; television for them is not a discretionary service.

When consumers are offered the opportunity to invest in digital television receivers, it will be vital that they have assurances that those sets will operate properly, that they will receive all of the local channels, and that if they move across town or across the country, their investment will be protected. Without such assurances, consumers would be reluctant to make such investments, and the whole transition to digital television would be prolonged or thwarted entirely. For broadcasters, broadcast equipment manufacturers, receiver and converter manufacturers, and consumers all alike, a swift transition is imperative to create an economically advantageous shift to digital television. Any doubt or ambiguity about the

⁵The NPRM at ¶29 names Dr. Jeffrey Krauss as a "critic of compulsory standards," referring to a 1982 published paper. In fact, that paper represents an evenhanded discussion of both the potential benefits and costs of standards. Among other things, it notes that "[e]quipment compatibility standards are valuable to society because they can prevent the purchase of duplicative or incompatible equipment or special devices that can convert from one standard to another." Dr. Krauss strongly supports the rapid adoption by the Commission of the ATSC DTV Standard. (See Jeffrey Krauss, CED: Communications Engineering & Design, June 1996, p. 24, urging the Commission to adopt the standard, assign the channels, and bring certainty to an uncertain market.)

standard to be employed will only retard the transition and increase costs, to the detriment of consumers and all segments of the television industry.⁶

Any such doubt or ambiguity would also compromise one of the Commission's primary objectives in this proceeding -- the rapid recovery of valuable television spectrum. Removing doubt and ambiguity by adopting a single, clear transmission standard will promote a swift transition to digital television which will allow the Commission to repack the digital channels more tightly once analog NTSC transmissions cease and to recapture large, contiguous blocks of nationwide spectrum that will be extremely valuable for a wide variety of wireless services.

As the NPRM makes abundantly clear, whether or not the Commission should set a single standard is not a new issue in this proceeding. We believe the Commission was correct in its 1988 Second Inquiry statement that the public interest compels a Commission role in the development of standards; and that establishing a standard has certain advantages such as pointing the various interested parties in the same direction, reducing the risk to both audiences and broadcasters of investments in systems that might become obsolete if a different system is introduced in the market, and overcoming reluctance to invest in new equipment. (NPRM, ¶23) And we believe that the predominant view among the commenting parties in the 1988 Second Inquiry favoring a single, mandatory standard is still correct, i.e., that such action would result in the most rapid development and acceptance of advanced television equipment, by promoting cost-effective receiver designs, thereby providing the largest audience for initial broadcasts of ATV programming. (NPRM ¶25) Furthermore, we believe the Commission was correct to conclude in its 1990 First Report and Order that "[c]onsistent

⁶When consumers purchase televisions, they are buying access to an entertainment/education/sports/information/news application. With personal computer applications, it has proven acceptable, if not always pleasant, to require consumers to purchase a software application that will operate only on a certain hardware standard, e.g., a game designed to run on an Apple Macintosh with certain minimum memory capacity. But this model won't work for broadcast television -- consumers must be assured that their television will receive *all* local broadcasts anywhere in the country, and broadcasters must be assured that a single bit stream will deliver programming to *all* receivers in the broadcast area.

with our goal of ensuring excellence in ATV service, we intend to select a simulcast high definition television system," and to reiterate that commitment in its 1990 Memorandum of Understanding with the Advisory Committee and the various ATV testing laboratories. (NPRM ¶26)

The NPRM highlights two "recent" developments that might arguably justify a different conclusion: first, the presence of a single consensus standard, in contrast to multiple competing systems in 1990, might make it unnecessary to mandate a single standard; and second, the opportunity afforded by digital transmission technology for each licensee to offer a unique set of services might make it less desirable to require a particular standard. (NPRM, ¶¶27-28) The first point rather remarkably overlooks the fact that the Commission's clear intention to select a single standard was fundamental to its decision to form the Advisory Committee, was central in motivating the Advisory Committee and the HDTV proponents to encourage and to form the Grand Alliance, and was essential in driving the subsequent actions of ATSC and the Advisory Committee to forge a consensus around a broadened ATV standard that included SDTV formats. Removing the assumption that the Commission would mandate a single standard would constitute an eleventh-hour reversal of the Commission's policy, and would threaten the industry consensus and inject a great deal of uncertainty, risk and delay into the process, jeopardizing a swift transition to digital television and the rapid recovery of valuable television spectrum.

The second noted change, the development of an all-digital system, far from calling into question the Commission's earlier decisions to mandate a standard, actually strongly reinforces the wisdom of doing so. The all-digital system represented by the ATSC DTV Standard brings flexibility and extensibility undreamed of previously, so the Commission's earlier modest concerns about imposing an *inflexible* standard have been fully addressed, there

is no real dilemma about mandating a standard, and the strong consensus view expressed in 1988 and adopted by the Commission in 1990 applies *a fortiori* today⁷.

Thus, the Commission's decision to require the use of a single broadcast standard is correct and essential. A mandated single standard will protect consumers, promote a swift transition, drive broadcaster and consumer costs down more rapidly, and allow the Commission to recover extremely valuable television spectrum as soon as possible.

A. The Full ATSC DTV Standard Should be Adopted

The Grand Alliance strongly believes that all layers of the ATSC DTV Standard should be adopted. The Advisory Committee and the ATSC have given careful consideration to what is essential in a standard. The proposal represents the minimum essential requirements to provide broadcasters and equipment manufacturers the information and assurances they need, yet allows tremendous room for flexible use, and for product and service differentiation and enhancements. Any proposal to limit the mandated aspects of the standard only to certain layers of the standard would inject the kind of uncertainty and unreliability described above, jeopardizing a smooth and rapid transition to digital television.

For example, if only the transmission and transport layers of the standard were mandated, with picture formats and video compression left undefined, there would be no reasonable assurance to the public that a DTV set would receive programs from all broadcasters. Likewise, broadcasters would have no assurance of an audience capable of receiving their broadcasts

⁷As the Commission notes in the NPRM at ¶40, the headroom for innovation and the flexibility of the proposed standard argue in favor of a required standard. Indeed, the capability of the system upon which the standard is based is understated in ¶40. For live sports programs and other kinds of action video, it will generally only be possible to carry one HDTV program at a time over the broadcast channel, but for many other types of typical video programming, it will be possible to carry one HDTV program and one SDTV program simultaneously, and for film and animation programming it is likely that two HDTV programs will be able to be carried while still maintaining excellent picture quality. In addition, the NPRM does not mention the ability to carry opportunistic data -- data which fills in the available capacity instantaneously when the actual video data requirement falls below the peak requirement. While more work remains to understand better how much capacity will be available for opportunistic data, it seems reasonable that opportunistic data could average at least 2 Mbps, a very significant capacity.

In addition, supplemental standards that build upon the basic ATSC DTV Standard have already been developed and adopted by the industry through the ATSC and more are in process. Once the basic ATSC DTV Standard is firmly established and its use mandated, these supplemental standards need not be mandated nor approved by the Commission.⁸

B. The Commission Should Incorporate the ATSC DTV Standard by Reference

Just as it did in 1995 with the ATSC standard for ghost canceling in NTSC television, the ATSC DTV Standard can and should be incorporated into the Commission's rules by reference, and need not be incorporated in its entirety.⁹ Two ATSC documents need to be referenced: ATSC Doc. A/53, ATSC DIGITAL TELEVISION STANDARD, 16 Sep 95; and ATSC Doc. A/52, ATSC DIGITAL AUDIO COMPRESSION STANDARD (AC-3), 20 Dec 95. Although the ATSC DTV Standard is a living standard that will evolve over time, these publications document the precise specifications that will allow broadcast and consumer equipment manufacturers to design and produce compatible equipment, and broadcasters to implement DTV services. In adopting the standard, the Commission should mention ATSC Doc. A/54, GUIDE TO THE USE OF THE ATSC DIGITAL TELEVISION STANDARD, 4 Oct 95, but this document should not be incorporated into the Commission's rules.

C. The Commission Should Rely Primarily on an Industry Consensus in Considering Future Changes to Its Rules Concerning the Standard

The Grand Alliance believes that the concerns expressed in the NPRM at ¶¶42-47 regarding the potential obsolescence of the DTV Standard are greatly exaggerated. The all-

⁸The ATSC has published a guide to the use of the ATSC DTV Standard, has adopted and published two supplemental DTV standards: System Information for Digital Television, and Program Guide for Digital Television, and has begun work on a supplementary DTV standard specifying a protocol for data broadcasting applications.

⁹In 1993, the Commission took a similar approach in amending its rules to provide for the optional transmission of a ghost-canceling reference within NTSC broadcast transmissions. Following an evaluation of competing proposals by ATSC, the winning system (developed by Philips Electronics) was adopted as a standard by a vote of the ATSC members, after which the Commission approved the ATSC recommendation and incorporated this new capability into its rules, publishing the technical standards for it in a technical bulletin of the Commission's Office of Engineering and Technology.

digital nature and the packetized data transport structure of the ATSC DTV Standard give it unprecedented flexibility and extensibility, i.e., the ability to handle a limitless variety of applications now, and the ability to incorporate new capabilities in the future without rendering earlier generations of digital receivers obsolete. This ability to incorporate changes and improvements is orders of magnitude greater than that of the current analog NTSC system. To be sure, no standard can be expected to last forever, given our collective inability to predict what technological innovations will occur decades from now, but at that distant date, the need to implement an entirely new system will probably be as evident then as it is today.

Accordingly, we strongly believe that a sunset provision on the mandatory use of the ATSC DTV Standard is completely unnecessary and would undermine the Commission's goal to promote a smooth and swift transition. Any suggestion now that the standard may soon become obsolete or superseded is wrong and would send inappropriate and counterproductive signals to broadcasters, manufacturers and consumers. And setting a sunset date far into the future would also be inappropriate, because neither industry nor the Commission can reliably predict when significant new developments will occur that will warrant reconsideration of the Commission's rules.

In keeping with the Commission's expressed desire to rely more on marketplace forces and the private sector and less on regulation insofar as possible, we believe that proposals to modify, to make nonmandatory, or eventually even to replace the ATSC DTV Standard should be made initially through an organization such as the ATSC where membership is open to all interested parties and where a cross-industry consensus can be developed. Such modifications could then be submitted by the ATSC to the Commission where any concerns raised by the public or otherwise identified by the Commission could be resolved before the ATSC modifications took effect.

Given this reliance on the private sector, it should not be necessary for the Commission to review the standard at a specific time, including whether it remains appropriate

to mandate its use. However, if the Commission feels that periodic reviews of the standard are necessary, the ATSC could be asked to provide the Commission with such reviews, including the need for any changes or the advisability of making use of the standard nonmandatory.¹⁰

D. Alternative Approaches to Requiring Use of the Full Standard Would Not Be Effective

Authorizing the use of the standard and prohibiting interference to it, but not requiring the use of it, as referenced in the NPRM at ¶48, would not provide the certainty and reliability that are necessary to unleash the substantial investments required of broadcasters, manufacturers and consumers for the conversion to digital television. Consumers must be assured that when they purchase a digital television receiver it will deliver the full designed performance anywhere in the country, and that their receiver will not be rendered obsolete by incompatible changes in broadcast equipment. Likewise, broadcasters must have confidence that widely available receivers from all manufacturers will be compatible with the signals they transmit, and that incompatible improvements in receiver designs will not impair or prevent the reception of their broadcasts. Such a weak approach as this "allow, but don't require" option would not provide an adequate basis for design or purchase, and would likely render the transition to digital television stillborn and make it impossible for the Commission to recover valuable television spectrum.

The Commission's unfortunate experience with AM stereo radio service illustrates the folly of failing to establish a single clear standard. AM stereo systems were ready for approval in 1982, but rather than authorize a single standard, the Commission decided to permit multiple standards and rely on the marketplace to sort out the best approach. Early attempts at multi-standard receivers were abandoned by manufacturers due to the cost and difficulty of

¹⁰For example, if the Commission deems such an approach necessary, the ATSC could be asked to provide a "state of the standard" report to the Commission every five years, including activities undertaken during the period, areas of current focus, indications of the breadth of participation in its activities, and processes for assessing technological developments that might warrant fundamental changes to the standard.

achieving adequate performance and the impossibility of picking a sure winner. Agreement on a single standard was not achieved until 1993 at the direction of Congress, and the service has never taken off. In contrast to this AM stereo radio debacle, with FM stereo radio service the Commission established a single clear standard, and the service became an immediate success in the marketplace as broadcasters rapidly implemented the service and manufacturers quickly began making receivers.

By adopting a single DTV standard, the Commission can avoid the kind of market uncertainty that paralyzed the introduction of AM stereo radio service. Moreover, in this case, there is far more at stake for consumers, because the quantum video and audio improvements and the associated information services available through the ATSC DTV Standard are vast compared to the incremental improvements offered by adding stereo capability to AM radio service.

Another possibility mentioned in ¶48 of the NPRM, adopting a standard for allocation and assignment purposes only, would be even worse than the "allow, but don't require" approach described above -- suffering all of the same frailties, and worse yet, failing to guarantee that one user of the broadcast spectrum would not interfere with DTV broadcasts in adjacent spectrum or in adjacent geographical areas, or with NTSC broadcasts during the transition period. Such an approach simply will not provide the certainty and clear direction that are required to get mutually dependent broadcasters, manufacturers and consumers to make consistent and mutually reinforcing investment decisions.

Similarly, mandating the use of only some layers of the ATSC DTV Standard would also be an inadequate and ineffective approach. In the lengthy Advisory Committee and ATSC processes of preparing and documenting a recommended standard, careful attention was paid to identifying what minimum aspects of the standard needed to be mandatory, and what could be left for differentiation and innovation in the marketplace. The resulting recommendation provides the minimum elements that are required to provide the necessary certainty and reliability, with unprecedented latitude remaining for differentiation and

innovation in broadcast programming and receiver products. Requiring only the RF/transmission layer of the standard would guarantee against harmful interference, but would give broadcasters, manufacturers and consumers no assurance that a reliable, consistent, and compatible nationwide digital television service would ever materialize, creating tremendous uncertainty that would stifle investment and render DTV stillborn. The Commission's primary goal in granting licenses for digital broadcasts and in establishing a supporting transmission standard is to define a complete digital television *service*, including video and audio, that will enable a competitive universal free broadcast television service to thrive in the years and decades to come. This requires a stable, definite, *complete* standard. Another vital goal in establishing a standard is to foster innovation, which requires the flexible but agreed-upon packetized data structure that offers unprecedented capability for providing other services as well, using the transmission and transport layers of the standard. The ATSC DTV Standard as a whole contains the elements necessary to satisfy both of these goals, but mandating only a portion of it would compromise the ability to achieve them.

The NPRM at ¶54 invites comment on the acceptability of the ATSC DTV Standard. This standard, based on the Grand Alliance system, is not only acceptable, it represents by far the world's best digital television system. Complaints by some members of the computer and motion picture industries are not new issues and are not well-founded -- they have been discussed and debated thoroughly over a period of many years, with a remarkably strong inter-industry consensus forming around the Advisory Committee recommendation embodied in the ATSC DTV Standard. In sharp contrast, there is no consensus at all for the changes proposed by these few parties, even within their individual industries, much less among the related industries that have an equal or greater interest in digital broadcast television, and these alternative approaches have certainly not been committed to prototype hardware and thoroughly tested as has been done with the consensus Advisory Committee recommendation over the past several years

As discussed in detail in Section V below, the ATSC DTV Standard is more easily interoperable, by far, with computers and telecommunications than any other digital television service on the planet. The Commission correctly recognizes the unmatched capability and flexibility of the system and the collective genius of its many creators, properly notes the years of thoughtful consideration and expert research and development in an open process in which all interests were able to participate, and correctly concludes that the burden of persuasion should be on any who would oppose the Commission's decision to mandate use of the ATSC DTV Standard. (NPRM, ¶54)

IV. Protection from Interference

A. Emission Mask

At ¶56, the NPRM seeks comment on a specific rigid emission mask designed to limit the out-of-channel emissions from a DTV station transmitter. The Grand Alliance has participated in discussions within the ATSC on this matter, and the Grand Alliance members endorse the proposal made in the ATSC Comments. As fully explained there, if a rigid mask is adopted, we recommend a somewhat different specification than that proposed in the NPRM, but we believe that a better approach would be to utilize an alternative mask based on a weighting function that can be determined from interference data collected at the Advanced Television Test Center ("ATTC").

B. Frequency Offsets

At ¶57, the NPRM seeks comment on a requirement for a precise frequency offset between the ATV pilot carrier and the color subcarrier of the lower adjacent channel NTSC station. Here again, the Grand Alliance members endorse the specific recommendations made in the ATSC Comments for the three cases that need to be considered.

C. Power Measurements

At ¶58, the NPRM seeks comment on proposals for specifying maximum power requirements and measuring actual power output. Again, the Grand Alliance members

endorse the recommendations contained in the ATSC Comments for a specification of allowed variation in average power as well as considerations for use of conventional instrumentation.

V. The ATSC DTV Standard Provides More than Adequate Interoperability with Alternative Media

In the NPRM (at ¶62), the Commission requests comment on the Advisory Committee's conclusion that the ATSC DTV Standard provides adequate interoperability with alternative media, on whether any critical interoperability problems remain, and on what other actions, if any, the Commission might take to facilitate interoperability. The Grand Alliance members have been heavily involved, especially during the last five years, in the Advisory Committee's extensive efforts to ensure that any recommended standard maximized interoperability with alternative media, including computers and telecommunications. After these years of effort and tremendous progress, we're convinced that the ATSC DTV Standard provides *far more than adequate* interoperability with alternative media, that no critical interoperability problems remain, and that the Commission need not take any further actions to facilitate interoperability. None of the objections raised by certain members of the computer and motion picture industries are new issues. They have been raised and debated thoroughly and repeatedly and addressed fully in the Advisory Committee recommendation which was adopted without objection by the Advisory Committee members, including members of these industries. Moreover, the Advisory Committee recommendation enjoys a remarkably broad consensus, as further evidenced by the nearly unanimous endorsement of the ATSC DTV Standard which embodies that recommendation.

A. Computer Interoperability

Any discussion of interoperability must begin by recognizing that the *digital* HDTV Grand Alliance system and the ATSC DTV Standard recommended to the Commission by the Advisory Committee represent by far the most interoperable broadcast television system ever conceived. Various subcommittees and working parties of the Advisory Committee, including

a special working party dedicated specifically to this issue and two specially organized interoperability review panels, labored long and hard over the past five years and more to ensure that the DTV standard maximized interoperability with other media, including computers and telecommunications, and their work and conclusions benefited greatly from substantial input and participation by computer and motion picture industry representatives.¹¹ Three of the key criteria used by the Advisory Committee in evaluating DTV proposals related specifically to interoperability. In developing the final specifications for the Grand Alliance prototype system in 1993, first the Grand Alliance members and then the Advisory Committee through its interoperability review panel worked to ensure that the final system incorporated the best interoperability features of the predecessor competitive systems, plus additional modifications that further promoted interoperability. The system's all-digital layered architecture, its packetized data transport structure, its use of headers and descriptors, its support of multiple picture formats and frame rates with a heavy emphasis on progressive

¹¹Under the early organization of the Advisory Committee, Working Party 4 of the Planning Subcommittee ("PS-WP4"), "Alternative Media Technology and Broadcast Interface," focused primarily on ensuring interoperability of the broadcast ATV standard with cable and satellite systems. In 1991, responding to concerns expressed to the Commission and to Congress by members of the computer industry, especially Apple Computer and members of the Committee for Open High Resolution Systems (COHRS, later called DOHRS), PS-WP4 was reorganized and under the chairmanship of Robert Sanderson of Eastman Kodak began a comprehensive effort to investigate interoperability, extensibility and scalability of proposed advanced video systems. This group worked actively and extensively over the next two years, with heavy participation by Apple Computer, Digital Equipment Corporation, IBM and other members of COHRS/DOHRS, to ensure that the selected ATV system maximized compatibility and interoperability with computers and telecommunications. One of the first contributions of this group was to establish the need for a system of headers and descriptors as part of the digital data stream as a fundamental requirement for achieving interoperability, extensibility and scalability. In September, 1992, PS-WP4 conducted a detailed interoperability review, evaluating the compatibility and interoperability features of five competing ATV systems. Following the formation of the Grand Alliance in 1993, the Advisory Committee's Technical Subgroup formed a Joint Experts Group on Interoperability, which among other things, sponsored an Interoperability Review Panel in October, 1993. Sixty-eight people participated in this review of the Grand Alliance system, including representatives of Apple Computer, Hewlett-Packard, IBM, Digital Equipment, DemoGraFX, Sun Microsystems, Delta Information Systems, C-Cube, DOHRS, MIT, Siggraph, Disney, Sony Pictures, Eastman-Kodak, Bell Communications Research, AT&T, MITRE, Rand, ARPA, NIST, and the White House. This panel reached a consensus that the Grand Alliance proposal demonstrated significant commitment to interoperability through incorporation of concepts of major significance, namely, all-digital implementation, layered architecture, header/descriptors, packetized data structure, and MPEG-2 based video compression. The panel also identified areas for further investigation, some of which led to modifications of the Grand Alliance proposal and improvements in the system ultimately recommended by the Advisory Committee.

scan and square pixels, and its compliance with MPEG-2 international compression and transport standards, give it unprecedented and unmatched interoperability with computers and telecommunications.

Indeed, in May, 1994, approximately 180 participants in the "Advanced Digital Video in the NII" Workshop, sponsored by the Clinton Administration's Technology Policy Working Group ("TPWG"), the National Institute of Standards and Technology ("NIST"), and several industry groups¹², recommended rapid adoption of a terrestrial broadcast transmission standard based on the Grand Alliance system, noting the significant contributions the system would make to improving the National Information Infrastructure. Subsequently, in January, 1995, this recommendation was approved by the Administration's full Information Infrastructure Task Force ("IITF"), the grandparent committee of the TPWG. The IITF fully endorsed the report and recommendation of the TPWG which found: 1) that rapid implementation of advanced digital television is critical to building the future video-rich NII; 2) that the Federal Government should fully support the FCC Advisory Committee process and the Grand Alliance's efforts to set an advanced digital television standard, and 3) that the Advisory Committee/Grand Alliance proposal for HDTV is the best available alternative -- "superior to . . . incrementally deploying a system that involves digitizing today's television signals, but not changing the fundamental picture formats and other technical parameters of the current broadcasting infrastructure."¹³ These conclusions and recommendations endorsing the Advisory Committee/Grand Alliance approach were made after thorough deliberations of the interoperability features of the proposed ATV/HDTV standard.

¹²Industry co-sponsors were the Electronics Industries Association, the Institute of Electrical and Electronic Engineers-USA, the Society of Motion Picture and Television Engineers, the Cross-Industry Working Team, and the ATSC.

¹³See *Workshop on Advanced Digital Video in the National Information Infrastructure*, NISTIR 5457, Georgetown University, May 10-11, 1994, and *Advanced Digital Video and the National Information Infrastructure*, Report of the Information Infrastructure Task Force, Committee on Applications and Technology, Technology Policy Working Group, February 15, 1995.

Moreover, as Richard E. Wiley, Chairman of the Advisory Committee, stressed in his December 1995 *En Banc* Hearing testimony before the Commission in this proceeding, these interoperability objections are not new. They have been considered and reconsidered and have not withstood the scrutiny of peer review in a consensus-driven process. Furthermore, the features of the ATSC DTV Standard that are the subjects of these complaints are *not* significant barriers to compatibility. Indeed, the ATSC DTV Standard based on the Grand Alliance system abundantly provides features to promote interoperability with computers and telecommunications, yet some in the computer industry *seek to deny* features that other industries deem vital to promote interoperability with systems, equipment and archived program material used in *their* industries.

The principal concern raised by these parties is the inclusion of interlaced formats in the proposed transmission standard.¹⁴ They argue that interlaced scanning is not sufficient for text or computer generated images, so including such formats will stifle the development of educational, scientific, and other services that seek to incorporate both video images and computer-based information. These arguments are misguided and incorrect.¹⁵

In the first place, computer-friendly progressive scanning has always been a cornerstone of the Grand Alliance HDTV system, which employs progressive scan for five of the six HDTV formats. All material originally produced on film, including all motion pictures and approximately 80 per cent of today's prime time television programming, will always be transmitted using progressive scan, and other video material such as news and sports programs may or may not be broadcast in progressive scan at the discretion of the

¹⁴Interlaced scanning is a video compression technique that sends one-half of the picture information in each of two fields -- first the odd-numbered lines and then the even-numbered lines. With progressive scanning, the lines are scanned in sequential order. The report of the 1993 Interoperability Review Panel stated that "[p]ersistence of interlace transmission (one of six formats) in the Grand Alliance proposal sustains the debate on interoperability. Neither the interlace nor progressive scan advocates have generated sufficient justification or rationale to converge their positions and every proposed format in the Grand Alliance proposal has supporters and detractors."

¹⁵Although MIT supports all of the six Grand Alliance HDTV formats, MIT has opposed the inclusion of interlaced formats for SDTV in the ATV standard.